Presenting my research – neuroscience & my interest in RDA

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Research focuses:
- Lipid rafts (cellular membrane microdomains) in metabolic diseases
- Connection of chronic stress & neurodegeneration
- Sex specificity in brain responses to chronic stress

ONGOING PROJECTS:

- **StressMe (Differences in stress response between men and women):**
  Stress response adapts physiology of the organism to the environment. Mild stress increases resistance to diseases, while prolonged stress participates in pathology of many diseases. In men, stress has been connected to cardiovascular diseases at young age, while women become more prone to metabolic and neurodegenerative diseases during premenopausal age. This project focuses on the influence of chronic stress on biological age of the brain in young and middle-aged brains of both sexes. Molecular basis of sex-specific differences will be evaluated by monitoring of epigenetic DNA changes in the hippocampus – brain memory center. The aim of the project is to suggest early interventions for neurodegenerative diseases and encourage personalized therapy.

- **Raft Tuning (Pathophysiological consequences of lipid rafts changes):**
  Lipid rafts are liquid-ordered sub-compartments of plasma membrane which co-cluster lipids and 35% of plasma-membrane proteins in dynamic structures called signalosomes. At least 11% of transmembrane proteins depend on glycosphingolipids, particularly gangliosides. Changes in composition of glycosphingolipids interfere with fine tuning of critical physiological processes like adhesion, signaling, forming barriers, cell migration, vesicular transport and apoptosis. Although changes in the ganglioside content of lipid rafts are the first sign of neurodegenerative diseases like Alzheimer and Parkinson these changes are also involved in other pathologies as diabetes through mechanisms that are not fully explored yet. The project will test whether the content of lipid rafts is disrupted in knockout mice for the key enzymes in ganglioside synthesis, affected in stress and aging and could it be successfully tuned by pharmacological manipulation.

Current activities and with relation to the work of RDA:
I am starting my first small independent scientific project (StressMe – described above) of chronic stress connection to neurodegeneration through mechanisms beyond genetics - epigenetic modification. This scientific aspect requires big data analysis, area that I am not very experienced in, but I am determined to improve my knowledge.

Also, I am involved in the study of sex specific regulation of diabetes showing different responses between sexes and between two different interventions in animal model of diabetes. One of the goals of the project is development of mathematical model for analyzing glucose and insulin tolerance tests, often used as clinical and preclinical tests for diagnosis of diabetes. These mathematical models produce data that are appropriate for open sharing among medical and biomedical community in order to develop better tests and more precise, personalized diagnostics for diabetic patients.

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